Attachment 1

Methodology for Determining Communities with Most Significant Exposure to Particulate Matter Emissions[1]

On October 11, 2001, Governor Gray Davis signed into law the provisions of Assembly Bill 1390 (Chapter 763, Statutes of 2001). This law modified requirements of the Budget Act of 2001 with regards to three incentive programs implemented in California to reduce emissions from motor vehicles and diesel engines used in trucks, buses, marine vessels and other mobile sources. Specifically, AB 1390 requires that air districts with more than one million residents ensure that " not less than 50 percent of the funds subject to (the) provisions (of the Budget Act of 2001) … are expended in a manner that directly reduces air contaminants or reduces the public health risks associated with air contaminants, …, including, but not limited to airborne toxics and particulate matter, in communities with the most significant exposure to air contaminants or localized air contaminants, or both, including, but not limited to communities or minority populations or low-income populations."

In order to meet the requirements of this state law, staff needed to identify communities with "the most significant exposure to air contaminants …" Community exposure to air pollution is the product of air quality and the number of people affected. This leads to the use of available data on emissions and population. Staff determined that the best available data sets to assist in defining target communities were emissions of particulate matter and location of residences with children and/or elderly persons. Staff focused on particulate matter that is smaller than 10 microns (PM10) as the air pollutant with the most serious health impacts. The Moyer program focuses on reducing emissions from diesel engines and diesel PM10 is a toxic air contaminant. We also have reasonably good data on vehicular PM10 emissions and emissions from stationary sources. Staff focused on the location of children and the elderly because both populations are at particularly high risk to negative health effects from being exposed to PM10.

Population Data

To determine the location of children and the elderly, staff relied on data from Census 2000. We obtained data at the block level and then aggregated the data to 1x1 kilometer grid squares. The corners of each grid correspond to points on the Universal Transverse Mercator (UTM) map coordinate system. Figure 1 shows the areas with the highest density of children (ages newborn to 17 years) and elderly residents (ages 65 years and older).

Emissions Data

Staff combined two sets of emissions data, one for stationary sources and one for motor vehicles, in order to determine where PM10 is emitted. Information on stationary source emissions of PM10 comes from the Air District inventory of emissions from permitted sources. The stationary emissions of PM10 were mapped to the same 1x1 kilometer UTM grid as was the Census data. The locations of the highest stationary source emissions of PM10 are shown in Figure 2.

Staff derived the emissions of PM10 from motor vehicles by using traffic data information supplied by the Metropolitan Transportation Commission (MTC) and emissions rates developed by the California Air Resources Board. MTC's traffic volume projections from their regional model are detailed enough for staff to assign emissions that occur within each of the same 1x1

[1] The methodology and its application were developed by Dr. David Fairley, Staff Statistician.

kilometer UTM grids as used for the population data and stationary source emissions of PM10. The areas with the highest combined emissions of PM10 from motor vehicles and stationary sources are shown in Figure 3.

Staff has not included emissions of re-entrained road dust, or PM10 emissions from locomotives, off-road equipment or marine vessels due to the lack of good spatial resolution data for those sources.

Areas of Significant Exposure

To determine the areas of the most significant exposure of PM10 emissions to children and the elderly, staff multiplied, in each 1x1 kilometer UTM grid square, the population density of the two target populations by the level of PM10 emissions occurring within that grid. This calculation provided the total direct exposure in person-tons per year to PM10. We recognize that the air quality impacts may sometimes be distant from the emission point. This would be the case for tall smokestack emissions from stationary sources. Nevertheless, total PM emissions are a good surrogate for the concentration component of exposure in this application. Emissions are aggregated over 1-km grid squares, and ground-level diesel engine exhaust produces the greatest health risks. To go beyond this level of analysis would require an extensive regional modeling effort.

Staff then determined that significant total exposure to PM10 from stationary sources and traffic occurred in any grid higher than 75,000 person-tons per year. This result is shown in Figure 4, with the black squares representing the target communities. The target areas are largely in San Francisco, Oakland, San Leandro and San Jose, with a string of areas along the Highway 101 corridor in San Mateo and Santa Clara Counties and small areas in Richmond, Martinez, Benicia, Pittsburg and Antioch. We essentially see areas where there are a high number of children and elderly living near major freeways, or, in the case of Richmond, Benicia and Pittsburg, living near major industrial complexes, such as refineries.

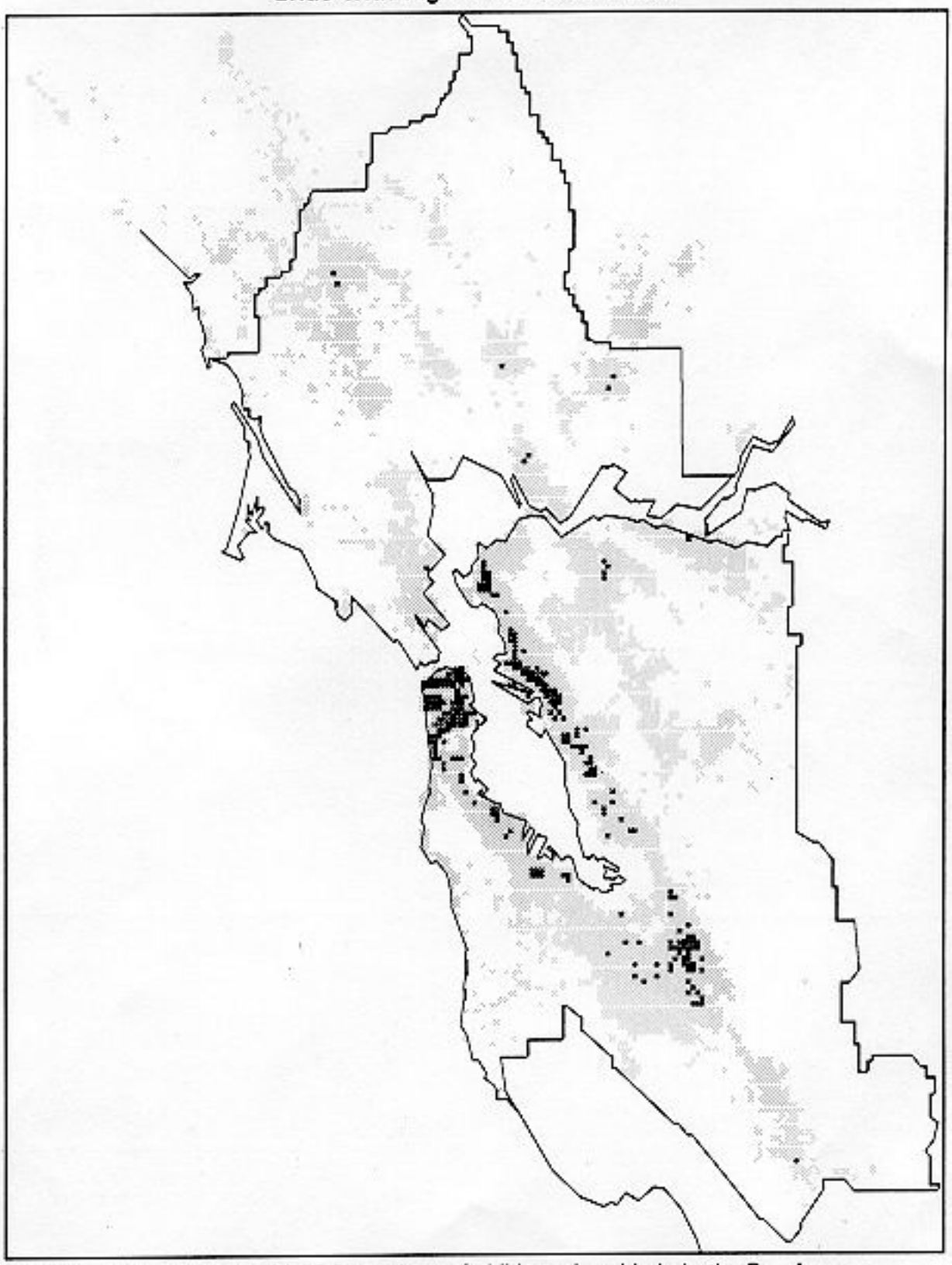

Figure 1. Grids (1x1km) with high numbers of children plus elderly in the Bay Area. Black grids represent > 3000 c+e. Dark grey represents > 1500.

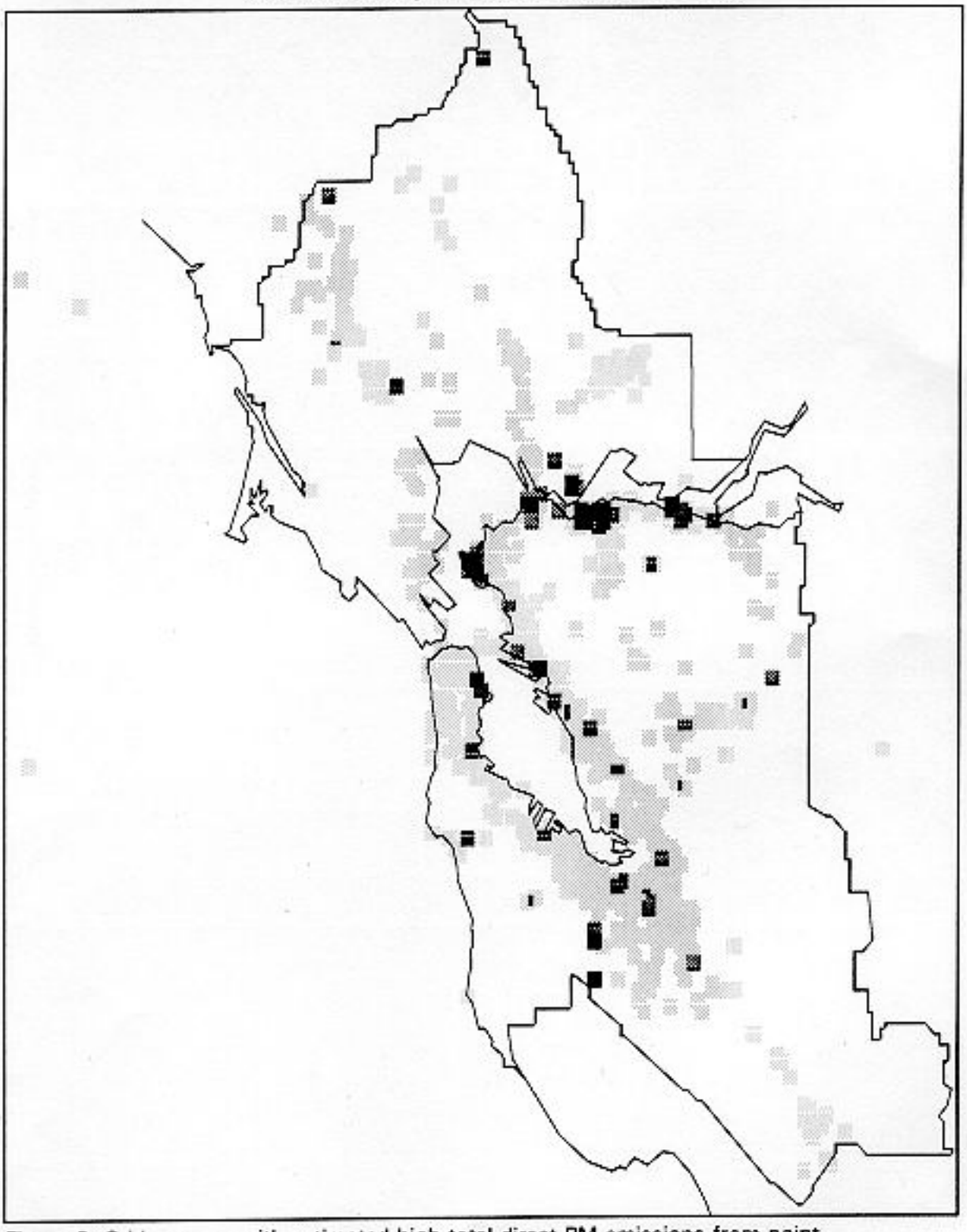

Figure 2. Grid squares with estimated high total direct PM emissions from point sources: at least 50 tons/yr (black squares), or at least 5 tons/yr (dark grey).

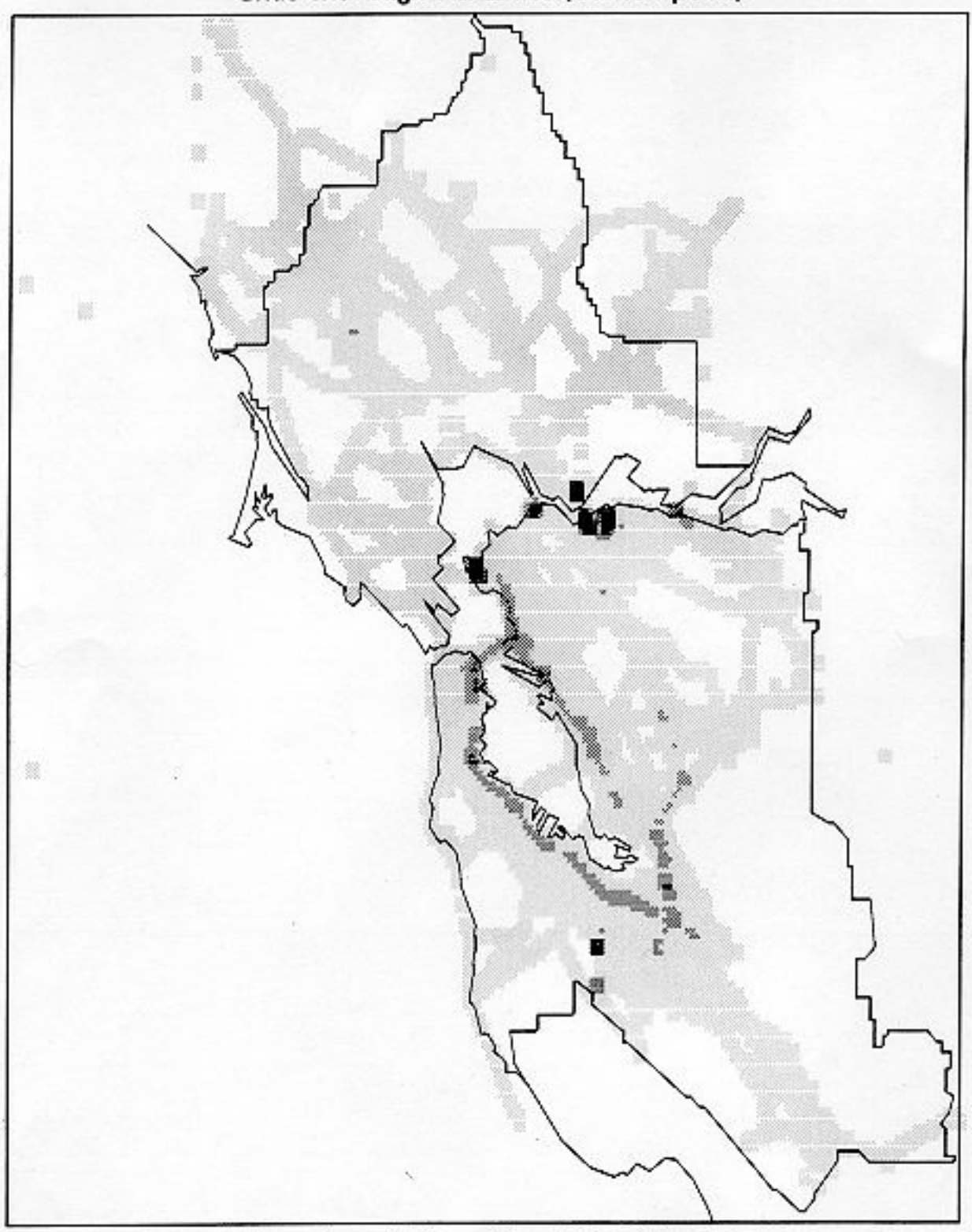

Figure 3. Grid squares with estimated high total direct PM emissions from point sources or traffic. Grids with at least 500 tons/yr(black squares), or at least 100 tons/yr (dark grey), or at least 50 tons/yr (lighter grey).

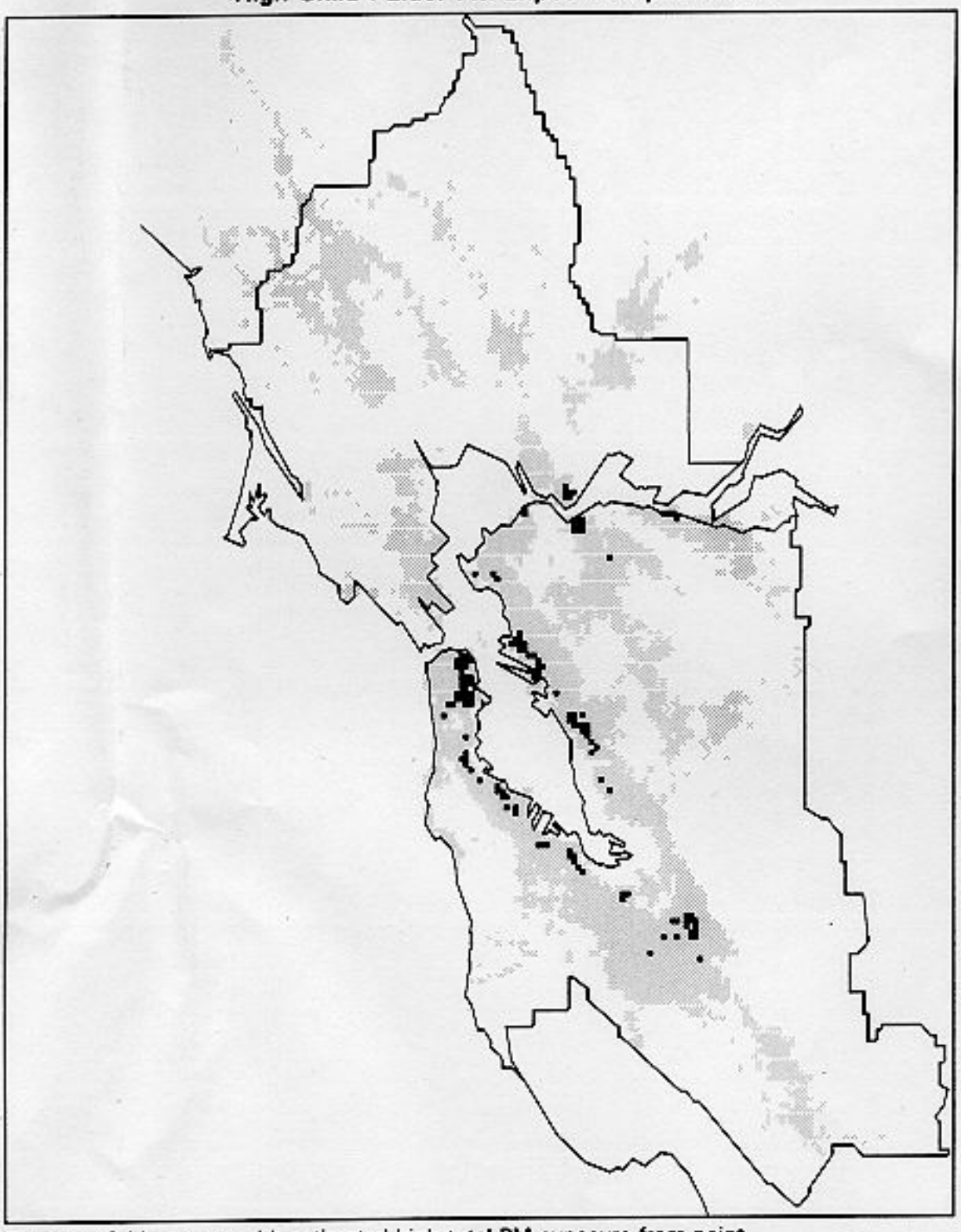

Figure 4. Grid squares with estimated high total PM exposure from point sources or traffic. Grids with at least 75,000 person-tons/yr (black squares).